

THE ANALYST.

APRIL, 1892.

THE LATE PROFESSOR REDWOOD.

We have to record with deep regret the death, on the 5th of last month, of the first President of the Society of Public Analysts, Dr. Theophilus Redwood, Public Analyst for the county of Middlesex, for the districts of Holborn and St. Giles, and for the borough of Luton. It is, however, in connection with Pharmacy that Professor Redwood's name will be longest remembered; he was one of the founders of the Pharmaceutical Society, and was intimately associated with it for a long period of years. He acted as Secretary to the Committee, appointed in 1854, to revise the London Pharmacopœia, and was personally entrusted by the Medical Council with the editing of the 1867 and two following editions of the British Pharmacopœia. In conjunction with Professors Graham and Hofmann, he was engaged by the Government to investigate the subject of fermentation; one result of their conjoint labors being the compilation of the Original Gravity Tables still in use. He was presented with the Degree of Ph.D. by the University of Giessen at the special request of Professor Liebig. On retiring from active life in 1855 he was appointed Emeritus Professor of the Pharmaceutical Society of Great Britain. Dr. Redwood had reached the age of eighty-six years.

PROCEEDINGS OF THE SOCIETY OF PUBLIC ANALYSTS.

A meeting of the Society was held on Wednesday, the 2nd of March, the President in the chair.

Mr. Arthur William Cooke, assistant to Mr. Fairley, was proposed as an Associate.

Mr. W. Chattaway was duly elected a member of the Society, and Mr. John Brown an Associate.

Dr. Vieth read the following paper:—

ON THE COMPOSITION OF MILK AND MILK PRODUCTS.

By P. VIETH, Ph.D.

THE paper which I am about to read is the continuation of a series of annual reports which I have on former occasions submitted to the Society, and treats on the work done in the laboratory, which is under my charge, during the year 1891. (For former reports see THE ANALYST, vii., p. 53; viii., p. 33; ix., p. 56; x., p. 67; xi., p. 66; xii., p. 39; xiii., p. 46; xiv., p. 69; xv., p. 44; and xvi., p. 61).

The total number of samples analysed in 1891 is 21,885, viz. :

19,849 samples of milk,			
1,299	„	cream,	
559	„	skim milk,	
40	„	butter-milk,	
119	„	butter and butter-fat,	
8	„	water,	
11	„	sundry articles.	

Of the milk samples 11,361 were taken from the railway churns in which the milk arrived from the country. Part of this milk is kept back for the production of cream; the bulk, however, is distributed with the least possible delay. Of the latter further samples—7,086 in all—were taken for analysis before, during, and after delivery for the sake of controlling the men who are entrusted with delivering the milk to the customers. The following table contains the monthly averages of the results of examination:—

AVERAGE COMPOSITION OF MILK.

1891.	Samples taken						
	On Arrival				Before Delivery.	During Delivery.	After Delivery.
	Spec. Gravity.	Tot. Sol.	Fat.	Sol. n. Fat.	Tot. Sol.	Tot. Sol.	Tot. Sol.
January ...	1·0321	12·86	3·77	9·09	12·75	12·86	12·92
February ...	1·0322	12·54	3·48	9·06	12·52	12·60	12·64
March ...	1·0323	12·62	3·53	9·09	12·62	12·71	12·74
April ...	1·0323	12·56	3·49	9·07	12·61	12·59	12·68
May ...	1·0324	12·58	3·49	9·09	12·69	12·61	12·74
June ...	1·0325	12·42	3·55	8·87	12·51	12·45	12·54
July ...	1·0321	12·55	3·74	8·81	12·60	12·54	12·60
August ...	1·0320	12·70	3·90	8·80	12·71	12·72	12·71
September ...	1·0322	12·93	4·05	8·88	12·87	12·89	12·90
October ...	1·0323	13·17	4·22	8·95	13·12	13·08	13·17
November ...	1·0321	13·21	4·30	8·91	13·06	12·99	13·10
December ...	1·0321	13·02	4·15	8·87	12·88	12·83	12·95
Yearly Average	1·0322	12·76	3·80	8·96	12·75	12·74	12·81

The variations in the quality of the milk have been of the same character as in former years, that is to say, the richest milk was received during the last quarter of the year, and the poorest milk during spring and early summer. The year 1891 is, however, distinguished by the fact that the quality of the milk was for some months lower than in preceding years. The monthly average for June, and the yearly average for 1891, are the lowest monthly and yearly averages respectively, which I have observed since the commencement of my work here in 1880. The agreement between the results of the several series of analyses is satisfactory.

The solids not fat were found above 9 per cent. from January to May, but from June to the end of the year always below 9 per cent. This is a consequence of an alteration in the calculation of the fat, Fleischmann's formula having been used during the former, Hohner and Richmond's during the latter period.

The examination of 1,254 further samples of milk supplied on special terms gave results which were identical with those already mentioned.

Cream samples were taken for analysis before the cream was sent out, and while it was delivered to the customers. The total number of these samples was 999, and their average quality was as follows:—

AVERAGE PERCENTAGE OF FAT IN CREAM.

1891.	Samples Taken	
	Before Delivery.	During Delivery.
January	46·6	47·0
February	48·5	48·4
March	49·8	50·2
April	50·2	50·1
May	49·8	50·0
June	50·8	50·6
July	50·4	50·3
August	47·4	47·8
September	50·4	50·1
October	51·4	51·9
November	45·7	46·3
December	46·4	46·8
Yearly Average ...	49·0	49·1

The composition of 51 samples of clotted cream was as follows:—

Total solids	... 54·45 — 74·84	average 66·05 per cent.
Fat	... 46·34 — 68·59	„ 59·30 „
Ash	... 42 — 77	„ 54 „
Solids not fat	... 5·38 — 9·57	„ 6·75 „

The amount of fat left in skim milk, resulting when cream is abstracted from milk by means of centrifugal cream separators was, in the majority of cases, not higher than .3, and in a very few cases only above .4 per cent.

The examination of 115 samples of butter gave the following results:—

English Butter, fresh and salt.—29 samples.

Fat	...	...	81.59 — 90.92	average	86.88	per cent.
Water	...	...	7.26 — 15.79	„	11.08	„
Casein, etc.	...	...	.22 — 1.59	„	.59	„
Na Cl.	...	...	.21 — 2.33	„	1.45	„

French Butter, fresh.—51 samples.

Fat	...	...	82.77 — 85.39	average	84.64	per cent.
Water	...	...	13.27 — 15.98	„	13.93	„
Casein, etc.	...	...	.93 — 2.00	„	1.33	„
Na Cl.	...	...	.05 — .18	„	.10	„

French Butter, salt.—5 samples.

Fat	...	...	82.81 — 85.46	average	84.14	per cent.
Water	...	...	11.13 — 12.98	„	12.08	„
Casein, etc.	...	...	1.65 — 1.97	„	1.81	„
Na Cl.	...	...	1.62 — 2.26	„	1.97	„

Danish Butter, salt.—19 samples.

Fat	...	...	81.37 — 86.52	average	83.80	per cent.
Water	...	...	10.94 — 15.45	„	13.35	„
Casein, etc.	...	...	.79 — 1.28	„	1.02	„
Na Cl.	...	...	1.26 — 2.39	„	1.83	„

Kiel Butter, salt.—9 samples.

Fat	...	...	78.83 — 87.78	average	85.01	per cent.
Water	...	...	10.23 — 17.71	„	12.33	„
Casein, etc.	...	...	.93 — 1.46	„	1.13	„
Na Cl.	...	...	1.06 — 2.23	„	1.53	„

Australian Butter, salt.—2 samples.

Fat	...	...	84.14 — 87.20	average	85.67	per cent.
Water	...	...	10.72 — 12.22	„	11.47	„
Casein, etc.	...	...	.85 — 1.33	„	1.09	„
Na Cl.	...	...	1.23 — 2.31	„	1.77	„

In the case of French and Australian butter, the item “casein, etc.,” includes boracic acid in some form or other; in other butters I have not found preservatives.

The volatile acids—Wollny figures—found in the several classes of butter were as follows :—

English butter	...	24.0 — 29.3	average 26.6 c.c.
French „	...	26.0 — 30.0	„ 28.1 „
Danish „	...	23.6 — 29.7	„ 27.2 „
Kiel „	...	21.1 — 27.8	„ 24.9 „
Australian „	...	30.5 — 32.5	„ 31.5 „

The Wollny figures were below the normal—25 c.c.—in one sample of Danish butter, of the origin of which I know nothing; in five samples of English butter, the purity and genuineness of which I can guarantee, as the butters were churned, so to speak, under my eyes; and in four samples of Kiel butter. The last-mentioned samples* came from the same dairy from which butter with abnormally low volatile acids had been received in 1889 and 1890, so that my experience with regard to this particular brand of butter extends now over three years. In every one of these years the Wollny figure was found to be below 25 from July to November, while during the remaining months it was normal. My friend, Dr. Schrodte, principal of the Dairy Experimental Station at Kiel, has investigated this case very closely, and his observations will soon be published in a paper which will appear in “*Die landwirtschaftlichen Versuchs-Stationen.*”

Dr. Vieth then read a paper on “The Average Composition of Milk,” after which Mr. Dyer read the following paper :—

FURTHER EXPERIENCE WITH ALKALI-GLYCEROL AS THE SAPONIFYING AGENT IN THE REICHERT PROCESS.

BY H. LEFFMANN AND W. BEAM.

AN experience of about a year, during which several hundred determinations of oleomargarine have been made, with the alkali-glycerol as described in THE ANALYST (August, 1891), has convinced us that the method is accurate and expeditious. We wish to note here, briefly a modification which we have adopted. We find it of advantage to omit the previous evaporation of the water from the alkali-glycerol, thus securing a mixture which is sufficiently fluid to be measured without previous heating. The same volume of the mixture is used, and the evaporation of the water and saponification of the fat require but

* The following are the individual results obtained at the times stated :—

1889.—25th June, 27.6; 2nd July, 25.9; 23rd July, 24.7; 6th August, 24.2; 15th October, 22.8; 5th November, 21.1; 4th December, 29.2; 10th December, 29.3.

1890.—30th July, 24.2; 14th October, 22.0; 28th October, 21.3; 18th November 26.1; 25th November, 26.2.

1891.—28th April, 27.6; 30th June, 25.3; 7th July, 25.6; 6th October, 21.4 and 21.1; 7th October 22.6; 25th November, 24.9.

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a minute or two longer than when the previously concentrated liquid is used. It is also found to be more satisfactory in manipulation since the temperature does not rise so high during the saponification.

Mr. Leo Taylor then read a paper on "Reports on Water Analysis," and this terminated the Society's Proceedings.

THE DRAWING UP OF CERTIFICATES.

By CHARLES E. CASSAL.

(Read at Meeting, February 3rd, 1892.)

It will be in the recollection of the Members of the Society that at a recent meeting of the Institute of Chemistry, a discussion took place on the "Ethics of Professional Certificates." Those who were present at that meeting will probably admit that the discussion was inadequate, no doubt in consequence of the intricacy, and especially of the tender nature, of the subject. I have no intention of dealing with it again here, much as it requires further discussion. My object in referring to the occasion is mainly to recall an observation of mine, which I desire to apply as a governing principle to the matter now in hand, namely, that the ethics of Professional Certificates cannot be held to differ fundamentally from the ethics of anything else; and that there is, or should be, nothing in professional chemical work whereby certain well-recognised principles of honour and of honesty should be disregarded, or to use a dangerous modern expression, "modified."

This being stated, it cannot be denied that from the professional point of view as well as from the standpoint of the general public, the method of drawing up Certificates and Reports, intended for official or public purposes or for private clients, is a matter urgently requiring our consideration, with a view of comparing our experiences, of stating our opinions, and if possible of arriving at some common basis of action, and of securing similarity of procedure at least to some extent.

The subject is necessarily one of much complexity, and I cannot hope to do more than introduce it in such a way as to serve as a "*point d'appui*" for a discussion. It would obviously be impossible to deal at length with the multiplicity of cases which occur in private practice, even if it were not an impertinence for any individual to attempt to do so; but the expressed opinions of the different members of the Society qualified to deal with the many and various branches of our work would, I think, if collated, enable us at least to see where we were.

Subject to the general principle of Ethics previously enunciated, I venture to put forward as my main contention that analytical data, and details of analytical processes should, as far as possible, be kept out of both reports and certificates. I am of course aware that in a great number of cases this procedure is not only impossible, but that the contrary is essential in regard at any rate to the giving of analytical figures. The

description of analytical processes in reports or in evidence is in my view to be absolutely condemned. But where figures are given, I hold that they should always be accompanied by an opinion or explanatory statement, and should be in the form of a separate report. It has been contended by some, that an analyst should confine himself in all cases to a bare statement of analytical figures, a view apparently arrived at in consequence of the unjustifiably absurd statements made—most frequently by persons who have no shadow of a right to practice analysis of any kind—upon altogether insufficient Analytical evidence, or upon no evidence at all. Such a contention cannot be maintained. To place in the hands of an ordinary client, or before a Public Board, a list of figures comprehensible only to experts, is an obvious absurdity. What is really wanted is the opinion of the expert, given clearly and definitely, and as far as possible in language that shall be “understood of the people.” What should be guarded against, and indeed, prevented as far as may be, are the erroneous conclusions and premature judgments of the non-expert or ignorant.

Dealing first with the certificates required from Public Analysts under the Acts, I contend most strongly that in *these*, analytical data should never, under any circumstances, be given. The contrary practice has been fraught with great evils to us as a profession, and has acted as a serious stumbling block to the efficient application of the Acts by the few Public Authorities possessed of sufficient collective enlightenment to try to apply them efficiently. Those who first introduced the statement of analytical data in official certificates no doubt acted in all good faith and according to their lights; but their proceedings were very unfortunate. Anyone who has been present in a Police Court and who has heard a magistrate, assisted by a solicitor or two, with the occasional intervention of an inspector and a defendant, struggling with “solids not fat,” “added water,” “fat and cream abstracted,” and so forth, must admit that analytical data are edge tools, wounding not only the ignorant—whose ignorance is generally of that dangerous character which leads them to believe they are wise—but also wounding those who have been indiscreet enough to bring these data forward in their certificates under the erroneous impression that, by so doing, they add to their reputation or magnify the value of their services. I am referring here to certificates relating to Milk, but my contention is universally applicable. Everybody concerned with them knows that the Adulteration Acts are cumbrous, and badly drawn, and that their provisions are apparently calculated to afford the largest possible number of opportunities for the escape of offenders. Still, under these Acts, it is not only quite unnecessary for a Public Analyst to give any analytical details in his certificates, but it is in contravention of the Acts to do so; a fact which makes the proceeding altogether indefensible, and indeed foolish. The 18th section of the Act of 1875 lays it down that the certificate of the analysis “shall be in the form set forth” in the schedule of the Act, “or to the like effect”—a very useful phrase. It is plain from this, that in order to meet the exigencies that might arise in the working of such Acts, discretion in the drawing of certificates is intended to be placed in the Public Analyst's

hands. Moreover, the Act lays it down that the Analyst shall state in his certificate the *result* and not the *results* of his analysis, and while if the latter word were used in the Act, an ingenious lawyer, disregarding the spirit and intention of the Act, might endeavour to show that this meant analytical data; the word "result" clearly precludes any attempt of the kind from being successfully made before any fairly intelligent tribunal.

If the form of certificate contained in the schedule of the Act be adopted, a Public Analyst will use the formula, "I am of opinion that the said sample contained the parts as under," or "the percentages of foreign ingredients as under." In the case of extraneous water in milk the matter is simple enough. The Public Analyst is certifying strictly in accordance with the schedule of the Act when he reports that there is a particular quantity of extraneous water present; but the case is different when he has to deal with cases of abstraction. Cases of abstraction of any kind must necessarily be reported under the Acts as cases of adulteration, although the popular acceptance of the term 'adulteration' does not take account of such cases. It has been my practice to draw certificates, relating for example to the abstraction of fat from milk in this way:—"The said sample had had at least . . . per cent. of the original fat abstracted, and was therefore adulterated." It has been contended that this form of certificate is not in accordance with the schedule of the Act, as the "parts as under," or "percentages of foreign ingredients as under" have not been referred to. We are perfectly within our rights in using the words I have quoted. As I think I have shown, we are not compelled under the 18th section of the Act to use the terms of the schedule, and if it became necessary, it would be well to get our Authorities to fight the matter in the higher Courts. I believe that if that were done we should be perfectly successful. I have often been asked by those who have defended vendors, to give what the questioners were pleased to term "the parts." While for the reasons previously mentioned, I consider that such a demand need not legally be complied with, it may, nevertheless, be convenient to adhere to the form of the schedule until, at any rate, the question is fought out. The persons who ask for "the parts" in most cases really mean the analytical data, which, as I have said before, should never, under any circumstances, be given; and I unhesitatingly affirm that these are asked for because it has been found that by their production it is possible to throw enough doubt and confusion into a case to obscure the real issues, and thereby enable offenders to escape. I suggest a form of certificate to meet these cases, and I shall be glad to hear it discussed. A milk from which fat has been abstracted can be certified as containing "the parts as under"—namely so many parts of genuine milk, and so many parts of milk devoid of fat. It is a question whether the words "containing the lowest permissible proportion of fat" might not with advantage be inserted after the words "genuine milk" in the foregoing form, but I am myself disposed to think that this would only weaken the certificate. In the form suggested it will be found, of course, that the figure indicating the percentage of adulteration is the same as in the statement of "original fat abstracted." A certificate thus drawn clearly complies with the schedule of the Act; the statement made

in the certificate is strictly in accordance with scientific fact; it is, according to the analysis, the composition of the sample which has been submitted to the analyst, and the opposition are therefore bound to accept it.

With reference to Butter, if a Public Analyst stated in his certificate the analytical data upon which he based his opinion as to percentage of foreign fat, the ridiculous nature of the proceeding ought at once to be obvious to almost anyone. "Reichert figures," and "Koettstorfer numbers," "Insoluble and Soluble fatty acids,"—what are legal luminaries to make of these? A number of more or less ignorant people talk glibly enough in Courts of Law and elsewhere about the Total Solids, the Fat, and the Solids not Fat of milk, and this in consequence of what I cannot help characterising as the highly indiscreet action of several chemists; and although with reference to butter and to other foods this kind of thing is by no means so common, it is beginning to grow.

In this connection it will be remembered that, unfortunately, certificates issued by the Somerset House Chemists on samples of butter, state the percentage of fat, the percentage of water, and, if I remember rightly, of curd and of salt found in the samples. So far as I am aware there is no particular reason why this course should be followed. In reference cases these data have no bearing of importance on the points at issue, and even if they had I should contend that they should not appear in the certificates. Moreover, the fact that they do so appear, casts an entirely unjustifiable reflection on the Public Analyst, implying as it does that these data should also appear in the certificate issued by him. I am perfectly well aware that our friends at Somerset House have no desire to do anything of the kind, and it is to be earnestly hoped that they may be prevailed upon to discontinue the practice.

The Somerset House certificates on samples of butter afford a very apt illustration of my present argument. The percentages of fat, of water, and of curd, are given; these figures appeal to some extent to the ordinary mind and lead to the belief that a very "complete" analysis has been performed, and that the certificate is so much the more valuable and important. I hasten to say, in all sincerity, that I am sure that to no reason of this kind is to be attributed the action of the Somerset House Chemists; I point out the fact in order that the effect produced may be appreciated. When, however, we come to the other data that occur in butter analysis, we find that these are (very properly) not mentioned in the certificates. As we are all aware they go on to say something to the following effect,—“from a consideration of the results obtained on the analysis of the fat,” “we are of opinion that this butter contains such and such a percentage of foreign fat,” or “we are unable to affirm that the sample is adulterated.” It has no doubt been felt that to give the figures would be both injudicious and useless. Examples of the inadvisability and absurdity of giving analytical data in official certificates might be multiplied extensively. A striking instance is afforded by the Iodine-absorptions of lards and oils. But what applies to Iodine-absorptions, to Reichert and Koettstorfer figures, to Insoluble fatty acids and so forth, applies equally to “Total

Solids," to "Fat" to "Solids not Fat," and to "Ash." What has been done with disastrous results in the case of milk, what has been done with still more disastrous results in the case of water analysis, is being done in many directions and must produce equally bad effects.

Another point of importance in the drawing up of official certificates is the statement of percentages. I have heard it said that the statement of a minimum percentage is improper. Although, personally, I adopt the plan of stating a minimum percentage of adulteration in most cases, I fully admit that a good deal may be said in favour of a different course. From a practical police court point of view, it may be found better to adhere to a rigid statement of percentage. At the same time I may say that I have found, and I daresay my experience is not singular, that a good deal of wind is taken out of the sails of a cross-examiner by the use of the minimum statement. An opposite experience may have fallen to others. The matter is one which admits of much discussion, but I hold very strongly to the view that such a discussion should be carried out privately. We have foolishly provided and still provide our many enemies with quite enough information.

In reference to certain cases, such as, for instance, the use of preservatives—salicylic acid in beer, or boric acid in milk or butter, if a Public Analyst states a percentage of adulteration under these circumstances, he beforehand prevents the success of the case, and accusations are at once made against his Authority of having brought a "frivolous charge" against a "respectable tradesman." Taking the case of salicylic acid in beer, if the amount is stated in grains per gallon, it is a very different thing; it is understood and held then that a grave offence has been committed. In cases of adulteration with "preservatives," where an analyst may be called upon to state the amount of the adulterant, he can do so, in the case of such an article as beer, in grains per gallon; and in the case of such a substance as butter, in grains per pound. We have, as Public Analysts, to work under very defective Acts, and we have to deal with a comparatively ignorant public. Under these circumstances, we should be foolish indeed to allow ourselves to be taken advantage of, and not to adopt obvious precautions. Apart from the insertion of analytical details in certificates, it is a question whether quantitative statements of any kind can legally be demanded of us in a number of cases. In the Act of 1875 it is laid down, with certain reservations, that if an article purchased is not of the nature, substance, and quality demanded by the purchaser, an offence has been committed. The 2nd section of the Amendment Act of 1879, provides, that it shall be no defence to prove that the article in question, though defective in nature, or in substance, or in quality, was not defective in all three respects; that is, proceedings would be justified by defect in any one respect. Defect in *quality* is therefore a defect sufficient to justify proceedings under the Acts. The presence of an adulterant clearly constitutes defective quality, if nothing else. The adulterated article is not of the "quality" demanded by the purchaser. Defect in quality cannot necessitate the statement

of percentage. A percentage of quality cannot be stated, and under these circumstances such cases as are afforded by the use of so-called preservatives could, I contend, under the present law, be justifiably and sufficiently dealt with by a Public Analyst, by his certifying the article to be defective in quality, in consequence of the fact that it contained the preservative, without stating the quantity of the latter. The mere presence of "margarine" for example, is sufficient under the Margarine Act, irrespective of quantity, to constitute an offence under that Act. It ought not to be necessary, and I think I have shown that it is not necessary, to give figures in every case of adulteration, if the provisions of the Acts as they stand are adhered to; and hence, that a certificate drawn in accordance with this view, without giving percentages or parts of any kind, would in many instances be good in law.

The drawing-up of certificates in the great number of branches of analytical work and in the various cases that occur in general practice, is a very wide question, and for obvious reasons I do not propose to go into it at any length. Water analysis, of course, strikes one at first as a branch of analytical work, where the statement of figures in consequence of long custom has come to be almost essential. Probably no analyst of standing issues a report on a sample of water without stating his analytical figures; but while custom has made it almost necessary for this course to be followed, it is certain that, originally, it was not a wise one. Analytical details in water analysis whatever processes or combination of processes are adopted, are absolutely incomprehensible, to the majority of the people before whom they are placed.

Some persons adopting particular methods of water analysis, are in the habit of saying that all other methods are unreliable, and yield no results of value. This again affords an instance of the evil done by drawing up water analysis reports in the way in which they are generally drawn up at present. It affords opportunities for unprofessional squabbles, and allows of the real issues of a case being obscured. In the special case of water, I consider that the analytical report should invariably be accompanied by an explanatory report in which a full opinion is given, on the clear understanding that the analytical report is for the consideration of Experts; and that the opinion is for the direction of those who have consulted the analyst.

As an answer to the objection that it is essential to publish analytical details to justify the opinions that are given, I may bring forward the case of the Reports on the London Water Supply by the three analytical chemists who are employed on behalf of the London Water Companies. I will ask anyone who has studied these interesting documents, whether the analytical details given ever seem seriously to affect the equanimity of the analysts. The data in fact always enable them to take a roseate view of things, and that is a peculiarity of data, especially in Water Analysis.

There are cases where people want to know the percentage of a particular constituent, or the amounts of particular constituents. I have already admitted that there are a great

number of instances where the non-supply of analytical details would be impossible. There, of course, the matter does not admit of discussion. An analyst is employed for a particular purpose, and if what he is employed to do is professionally legitimate, he must do it; but I would say that very frequently in these cases the information is far more detailed than it need be, or, indeed, ought to be, considering the remuneration. Again, the publication of details of analyses may often be exceedingly useful to analysts who wish, for any particular reason, to cut up their professional brethren. While I say that, in the present condition of our profession, it may be necessary that nondescript hangers-on, and indeed, unfortunately, some members of it, should be dealt with severely in public, still this cannot be regarded as a desirable thing in a profession. The giving of analytical details may be useful for the purpose of exposing an incapable or ignorant man. It may be made useful also for showing those who are neither incapable nor ignorant how very absurd they may be made to look by quotations from their reports.

I say, finally, that it is most important for analysts to be agreed among themselves as to the course to be pursued. If one Public Analyst, for instance, has a prosecution undertaken on a certificate not showing data, and another Analyst, or worse still, another Public Analyst, appears in Court as a witness for the defendant and puts in a certificate showing quantitative details, the profession suffers. It is injurious to any profession that matters of this sort should be fought out in a police court, or indeed anywhere before an audience of the ignorant. Although I fear that I have hardly done justice to a subject which requires very full treatment and very careful handling, if the matter is adequately discussed by the members of the Society of Public Analysts, I have no doubt that useful conclusions will be arrived at. In this, as in all other matters affecting our profession, we must act together; united we can stand; divided, if we do not actually fall, it is certain that we shall never rise beyond the position we at present occupy.

DISCUSSION.

The President (Mr. Hehner) hoped that a considerable amount of discussion would take place upon Mr. Cassal's able paper. It touched upon a matter which affected every Public Analyst and every analytical chemist. He most heartily agreed with almost everything Mr. Cassal had said. It could not be expected that in a subject of such importance and magnitude they could all agree in every particular, but he had no doubt whatever that the observations of Mr. Cassal were worthy of their most careful consideration.

Analytical chemists were called upon to give two sharply-distinguished kinds of reports based upon analytical investigation. There were, first, the reports which were solely or almost solely wanted for the analytical figures given in them, such as percentage of gold or other metal in an ore, phosphoric acid in manure or manganese in iron. In these cases the clients on whose behalf the analyses were made, understood the exact significance of the figures. Then there was that large class of certificates, which included all certificates under the Sale of Food and Drugs Act, in which the analytical figures

were only the means of guiding the analyst to a correct conclusion, and in which, in the words of the Food Act, an opinion only was required. In these cases the figures were obtained, not for the client, but for the analyst himself. If an opinion on a sample of milk, butter or water was asked for, the analyst could not give that opinion without first making an analysis, and from this he formed his opinion. It could not matter to any client to what kinds of analytical processes the sample had been subjected, provided the analyst gave, to the best of his knowledge and ability, the opinion which was asked of him. Indeed, if figures were given in such cases, the analyst did something for which he had not been asked at all; and the figures in most cases would not only be entirely unintelligible to the client, but would actually confuse him. In other cases figures were positively dangerous, as they enabled unscrupulous persons to circumvent the efforts of the Public Analyst, as in the case of milk and butter. He regretted very much that there had ever been any public mention of such terms as solids not fat, insoluble fatty acids, Reichert figures, and such like. These were scientific matters which they should discuss between themselves and for professional advancement; yet by the mistaken anxiety of analysts to justify their reports, they had become terms with which the public was now familiar. In time the analyst might be expected to go still further and to tell his clients every step he took to get at a result. Although he had for a long time refused to give his clients any information as to the processes of analysis adopted, which would be done in the case of articles of food if analytical figures are given, yet he had from time to time been positively requested to furnish analytical figures. He had made it a rule, rather to refuse and return the samples than to give this information, unless very strong reasons were given for so doing; because he could perceive that the figures in many cases like this were wanted for the purpose of defeating the efforts of Public Analysts. As soon, for instance, as it was known, what percentage of fatty acids or what Reichert figure would pass a sample of butter as genuine, certain dealers at once worked up or down to these limits.

On the other hand, it would have to be acknowledged that it would be impossible, without analytical figures, to judge what value attached to any particular certificate, for figures in many cases could be checked, proved or disproved. But even figures were not always conclusive evidence of *bonâ fide* work. He believed that any dishonest proceeding in analytical practice must defeat itself in the end. The value of the certificate could not be measured as a rule by the figures which might be contained in it, but rather by the signature at its foot. Then there was another question, which he believed had much to do with the giving of figures in reports; where such had not been asked for analysts had an impression that they must show something for their fees. An opinion occupying, perhaps, two lines of a certificate, might possibly not appear to a client, who may not know, that these few lines may be the outcome of a lengthy analysis or investigation, and of a great deal of laborious work, to be worth two, three or more guineas; whilst a formidable array of figures would constitute a claim for a respectable bill. This view of the case

was confirmed in his mind by the Continental practice of charging for every single determination, or even for every single weighing, the price lists of Continental analysts setting often forth the ridiculously small sums charged for each item, and which, like lawyers' bills, might yet amount to a considerable total. He thought that this was a very degrading way to look upon an analysis and the duties which one owed to one's client. It tended to make the analyst a mere analysing machine who made certain determinations at the bidding of his client.

As to figures in water analysis, nothing was more common than to receive a request from an otherwise intelligent client, to test any particular sample for purity, with the intimation that an analysis is not required; thus clearly showing that the client often thinks the analytical figures so constantly given in water analysis are to him an unnecessary piece of information. And, as a matter of fact, it appears to me nothing short of absurd, to furnish the public, in reply to a request for an opinion as to the purity by the water supply, with a long string of figures, which has not been asked for and which is unintelligible to by far the majority of educated men. It is only the Analyst's Report, that is to say, his opinion, which is wanted, and not his figures at all. These were unmitigated evils, and he hoped that the practice would be dropped.

It had been stated by Mr. Cassal that he thought the word "quality" mentioned in the Act might be used in connection with the suppression of preservatives in butter, and that it might be said that the article was deteriorated in quality by the addition of preservative. He (the President) thought that the word "quality" as used in the Act must be construed in the common sense and not in the analytical sense; and he could not think that a substance which was added to butter with the intention, and with the effect, of preserving the butter as to quality, could be condemned as if the quality of the article were thereby deteriorated.

Mr. G. Embrey considered that Mr. Cassal's paper raised one of the most important questions which they could discuss, and that, whilst agreeing generally with Mr. Cassal's opinion as regards certificates of food, he could not entirely agree with him in his views with respect to certificates relating to water. In regard to food, he might mention that some years ago he was in the habit of giving the total solids and fats, until some magistrates who were much wiser than he, thought it only gave solicitors an opportunity of making a muddle of their cases, and the climax was reached when a solicitor, who had been reading a book on Food Analysis, asked him if he had estimated the amount of lactochrome in a milk analysis. He then gave up the practice; and since that time he had never given figures. He had had a case in which a solicitor had objected that he (Mr. Embrey) had not complied with the Act of Parliament, but the case was dismissed for another reason. Coming to the question of water analysis, he disagreed with Mr. Cassal altogether; there were so many humbugs, and it was so difficult to detect them. There were Medical Officers of Health, who analysed samples of water for absurdly low

fees. There were plenty of Medical Officers of Health—there were several in his own county—who, when they received a sample of water, put it into a wine-glass, added some pyrogalllic acid, and then some salt, allowed it to stand, and if it turned black condemned it as unfit to drink. These people, in their reports, simply stated that the water was unfit to drink; they gave no reason for their statement, they could not give figures, because they were incapable of performing an analysis. He believed that if, in the case of water analyses, one did not give figures, one would not get paid.

Mr. Cribb said that he had seen in a trade journal a report of a police court case, in which an analyst certified that a sample of butter contained no less than 99 per cent. of fat "other than that of butter." He was always under the impression that it was impossible for butter or margarine to contain 99 per cent. of fat of any kind. As regards the method of drawing up certificates for butter adulteration, he was aware that many analysts calculated the percentage of foreign fat upon the fat itself, and then assumed that that percentage held good for the whole butter. But was there any justification for this assumption? If, on the other hand, the water, salt, and curd were determined and considered as belonging to the *butter* and not to the adulterant, and allowance made accordingly, then it appeared to him that the actual percentage of adulteration was being considerably under-stated. At the same time he thought it was the only correct method if the sample was certified, as containing a percentage of *foreign fat*, as obviously water, salt, and curd (though partly belonging to the adulterant) could not be included under this head. He should be glad to hear the opinions of others on this point. With respect to cheap analysis of water, he would like to mention, as an illustration of the unprofessional conduct which is rife at the present time, that having as clients of some years standing, a firm who sent him a large number of waters, another analyst had made them an offer to do the same analyses for half the usual fee; and, having been refused, actually offered to do the work for nothing in the hope of gaining a certain amount of publicity in the brewing trades with which the firm were connected. Regarding the question as a whole, he entirely agreed with Mr. Cassal, that figures should not be given in analytical certificates, except in certain cases. He would hesitate to adopt Mr. Cassal's suggestion as to skimmed milk certificates, on account of the difficulty of making the matter clear to the magistrate. He spoke feelingly on the subject, for the reason that recently he had had to attempt to explain to an ordinary lawyer, how the percentage of added water was calculated from the results of a milk analysis; and after an expenditure of not less than 30 minutes, the solicitor left and went away, saying that he thought there must be some fallacy in the method of calculation.

The President said that if a sample of butter were brought to an analyst, he was asked whether it consisted of genuine butter or whether it were mixed with margarine, and in that case with how much margarine? It seemed to him that it was taking up a mistaken position if the analyst, in his Report, made any reference whatever about "fat" or any other constituent of butter, as he was asked nothing about these,

The Act of Parliament required a statement of the percentage of foreign ingredients, but the foreign ingredient in a sample of adulterated butter was margarine, not foreign fat. Butter and margarine in themselves consisted of water, curd, salt, and fat, therefore the article, as a whole, had to be considered and reported upon, and not any particular constituent of it.

As regards the statement of results, and the question whether any calculation was required to deduce from the analysis of the fat the percentage of margarine or butter, he would point out that, as both butter and margarine contained each about 15 per cent. of matters other than fat, the proportion of mixture in the fats melted out from the whole was still the same as in the original article. Therefore, if on analysing the fat itself, it were found that it was a mixture of 80 parts of butter-fat and 20 parts of other fat, then the original article had also been mixed in these proportions.

As a further instance of the mischief made by analysts in giving analytical figures for which they were not asked, he might say that he (the President) had formerly always been in the habit of stating the strength of samples of spirits taken under the Food Acts in percentages under proof, adding, in the case of dilution, the percentage of added water. As the latter was deduced by calculation from the former, but was of course not identical with it, explanations had from time to time to be given to enquiring magistrates, with unsatisfactory results, until he was at last requested in future to give no figures in spirits whatever, except on the percentages of added water. There could be no doubt that that was all the magistrate wanted. All certificates that had to go before a court of law ought to be as simple and as unencumbered with unnecessary matter as possible, such information being entirely reserved for oral evidence, if necessary.

Mr. Sidney Harvey said that soon after he joined the Society he asked the late Mr. Wigner whether the time had not come to have a fixed mode of drawing up their official reports. He felt very much at sea upon the subject, as he had only just commenced work as a Public Analyst. He was told by that gentleman, and by others, that it was not wise to coerce Public Analysts in the matter, but that it was best to allow them to adopt their own methods. He (Mr. Harvey) regarded that as a great mistake, and he had waited to see if some one would "bell the cat." He now found that he had been a great sinner in this procedure, for, in the absence of anything like precedent, he *had* furnished figures, and very much for the reason that unless one gave figures, public bodies thought one did not earn one's money. At the same time, figures had got him into a great deal of trouble and he would, in future, refuse to give them. All, it appears, he had to do was to state the probable proportion of the adulterating ingredient. With regard to waters, his experience had been a singular one. When he first made official statements as to purity of waters and their fitness for drinking purposes, several authorities begged him not to give figures at all, but simply to say whether the water was fit for drinking purposes or not. But when it became a rule in his part of the country, that reports were sent straight to the Medical Officer of Health, by whom they were endorsed, the case wa

somewhat altered. He made a statement of the purity of the water on one page, and he gave a list of figures upon which he founded his opinion on the other. It appeared to him that in such a complicated matter as a water analysis, it was very desirable that as many data as possible should be accumulated in every case; although he must admit that local authorities often blundered over the figures, and thus caused a very great deal of trouble. He had been reminded, for instance, of the fact that fifteen or sixteen years ago, he had passed waters containing large amounts of nitrates which he had since ceased to do. He apprehended that the remarks made by previous speakers did not apply to manures, &c., but were entirely confined to the work of Health Analysts, and Public Analysts.

Mr. Robert H. Davies remarked that Mr. Cassal had indicated certain cases in which it was desirable to express results in other ways rather than in percentages; this had long been the practice in stating the amount of alum in bread, in which the number of grains per 4lb. loaf were given. He generally agreed with the observations made by the reader of the paper, and also acknowledged the wisdom of omitting analytical results wherever possible, from official certificates. He himself had been in the habit of giving figures, simply because the chemist, with whose methods he was best acquainted when he commenced practice, was accustomed to do so. As regards the wider question, whether ordinary certificates and reports should include analytical figures, that appeared to him to present great difficulties. In many cases clients, who understood the meaning of the figures, would much like to have them, and would not be satisfied with a bald statement to the effect that, say, a sample of milk or butter was pure or impure. He could not see how, in such cases, the analytical figures could be refused.

Mr. Cassal, in reply, said he was glad that a discussion of some value had taken place. He hoped, however, that the matter would be discussed again before long. It was a subject upon which so many men were competent to speak, and ought to speak, that it would be a great pity, if, in the near future, a discussion could not be again arranged, so that the profession could have the benefit of additional opinions. He noted, with much satisfaction, the general agreement of the members present, that the old practice of stating analytical details in certificates given under the Acts, was irregular and objectionable; that it was injurious to the profession, of no value to magistrates, or to the public, and that it ought to be entirely given up by all Public Analysts. In this connection Mr. Davies had given an example of the evils of precedent, by citing the case of the district where, in the remote past, the analyst had been in the habit of giving, in certificates on samples of butter, the percentages of water, of fat and of curd, and where, in consequence, this mistaken practice had been continued to the present day.

The President had truly said that an analysis was, in reality, the private property of the analyst. Those cases where the amounts of particular constituents were required, were of course to be excepted. He (Mr. Cassal) specially excepted those cases, although he would again point out that in many instances far too much information was given,

even for private clients ; and this for the bad reason, that it tended to produce in the minds of clients the notion that the analyst who followed this course was superior to other analysts. In fact, it was done with the idea that more "business" would thereby be obtained. This was a mistake. He did not believe that professional work was increased by this kind of procedure. If he was wrong, and the opposite was the case, then he contended that such a method of increasing work was professionally illegitimate.

The argument that the giving of figures would prevent the practice of analysis by unqualified and incompetent persons nevertheless required careful consideration. This was to be distinguished from the case of one qualified and competent man trying, by the giving of figures, to get the better of another. Mr. Embrey had given the meeting some startling instances. He (Mr. Cassal) had never yet heard of medical men "performing analyses"—and what performances they must be—for the trumpery fees mentioned by Mr. Embrey. It was unfortunately true that certain medical men were in the habit of giving puffing testimonials founded upon no analytical evidence whatever ; while others, devoid of special training and engaged chiefly in medical work, very improperly undertook the analysis of water and foods.

Would the giving of analytical details by professional analysts put a stop to this kind of thing ? He thought not. As a preventative it was insufficient. The generality of people were not sufficiently intelligent to grasp the difference between a report which contained figures, and a report which did not, and to distinguish by that means between the man who had a right to report and the man who had no such right. Other and more powerful means should be adopted. The Society of Public Analysts existed not only for the discussion of scientific matters of interest to its members, and of public importance but it existed also for the discussion of matters that were of vital professional importance ; and it was of vital importance that such a state of things as that described by Mr. Embrey should not be tolerated. The Society could, if it chose, take up a strong position in the matter, and the members, by united and resolute action, could largely prevent the unfair and degrading competition that had been described. The time was rapidly approaching when what he might call "Professional Unionism" would be a necessity, and he did not see why it should not now be openly and boldly advocated.

In reply to Mr. Harvey, he desired to say that he did not intend to limit the suggestions made in the paper to official analyses under the Acts and to matters relating to Hygiene. There were many other cases where it was injudicious to give figures. The analysis of oils afforded an example. A Public Board, buying a number of different kinds of oil, would submit samples of these for analysis. It would be injudicious to put analytical details into the Report, which, of course, was a Report issued by an analyst acting in his private capacity. The analyst would be acting wrongly and foolishly if he gave the data upon which he based his opinion that a sample of colza oil was adulterated with mineral oil. He had admitted that he was somewhat uncertain as to what could be

done at present in reference to water. In introducing the discussion, he had said that it would be a matter of very great difficulty at the present time to refuse to give analytical details in reporting on waters. In certain other special cases, and to *bona-fide* private clients, it might be necessary or advisable to give analytical figures, when it was known that such figures would probably not be made use of in any way that might be detrimental to the profession. After all, in most cases, it was the analyst's opinion that was required. If people had confidence in him they took his opinion; if they had not that confidence they did not.

In conclusion, Mr. Cassal urged that in all matters of dispute the Council of the Society of Public Analysts should be appealed to, as representing the only scientific and professional body in the Country having the right to give authoritative opinions on analytical matters and he again insisted on the necessity of united action.

Rum and its Adulteration. A. Scala. (*Gazzetta. Chimica. Italiana.* 1891—396.)—After a lengthy discussion of the origin and adulteration of rum, the author gives the composition of 5 rum essences, used at Rome for adulteration.

	Formic ether	Acetic ether	Alcohol vol.	Alcohol vol.	Extract	Ash	Colour	Smell
1	0.46	9.11	68.76	61.13	1.98	5.02	Caramel	Cinnamon
2	0.95	6.11	78.40	63.45	3.18	0.06	"	"
3	0.77	8.93	59.34	51.50	2.53	0.04	"	"
4	0.76	13.02	49.91	42.38	7.94	0.15	"	"
5	1.36	26.90	44.50	—	—	—	"	"

Formic ether 1 : 6.43 to 1 : 19.8.
Acetic ether

All 5 samples gave a strong Schiff's reaction.

The total ethers were estimated by saponification, and the Formic ether by the quantity of reduced mercurous chloride obtained on warming the neutralized saponified solution with mercuric chloride; the difference between the alkali required to saponify the total ethers and that for the Formic ether was calculated to Acetic ether, though other ethers (Butyric) were proved to exist.

The substantial accuracy of these methods was proved by experiment.

The author also analysed a genuine Martinique Rum, an artificial one, and 7 samples bought in Rome.

	Name	Price per litre	Formic ether	Acetic ether	Alcohol		Extract	Ash	Amyl alcohol	Schiff's test	Reaction with sulphuric acid
					Volume	Weight					
1	Martinique	—	.012	.297	52.01	44.36	.364	.062	.266	V. weak	Strong
2	Artificial	—	.026	.169	55.83	48.05	—	—	.169	Distinct	Weak
3	Jamaica	7 lire	.004	.140	60.85	53.00	.554	.018	.066	"	None
4	—	2.5 "	.006	.032	43.13	36.17	.194	.016	.047	None	"
5	—	3 "	.006	.089	34.67	28.69	2.047	.011	.073	Distinct	V. weak
6	—	4 "	.001	.141	47.89	40.50	.810	.028	.206	"	Strong
7	—	3 "	.005	.071	47.02	39.70	.996	.012	.150	None	V. weak
8	—	2.5 "	—	.024	38.89	32.37	2.212	.012	.033	Weak	None
9	—	4 "	.009	.056	52.91	45.23	.654	.020	.192	"	Strong

The characters of the aqueous distillate were :—

- | | |
|--|-----------------------------------|
| 1.—Gave a very strong persistent smell of Rum. | 6.—Gave fairly strong ,, |
| 2.—,, a foreign odour. | 7.—,, very weak ,, |
| 3.—,, no odour of Rum. | 8.—,, no smell. |
| 4.—,, very weak odour of Rum. | 9.—,, fairly strong odour of Rum. |
| 5.—,, ,, ,, | |

He concludes that natural Rums can be distinguished from artificial or watered Rums by:

1. The quantity of ethers, alcohol [? amyl. Abs.], which is different in artificial and watered Rum to that in natural Rum.

2. The reaction of sulphuric acid on the aqueous distillate [the portion left in the retort], giving a rose-violet with natural Rums, and less intense or absent in adulterated or artificial Rums.

3. The smell of the aqueous distillate when rubbed on the hand is very strong and persistent with natural Rums, and less so or absent with diluted or artificial Rums.

H. D. R.

[NOTE BY ABTRACTOR.—The author had overlooked the fact that distillation with a very perfect dephlegmator gives a rum containing much less of the impurities on which his methods of distinction depend; it is unlikely that No. 3 in his list, for which was paid the highest price of all, should be entirely artificial, as he is inclined to conclude].

The Examination of Platinic Chloride for Purity. A. F. Holleman. (*Chem. Zeit.* 1892, xvi. 35).—The usual tests for the purity of platinic chloride, namely, that it should dissolve clear in absolute alcohol, and the residue left by its ignition should yield no soluble matter when treated with dilute nitric acid, do not give sufficient information. A sample answering to these tests gave unsatisfactory results in the determination of potassium, and upon examination proved to contain sulphuric acid in appreciable quantities. It is, of course, absolutely necessary that this acid should be absent, both for the reason which leads to the scrupulous removal of all sulphates previous to the precipitation of potassium platinic chloride, and also on account of the likelihood of a trace of barium chloride (used for removing sulphates) being present in the solution of the alkali to be precipitated, which would, if neglected, cause the precipitate of potassium platinic chloride to be contaminated with barium sulphate, should the platinic chloride contain sulphates.

B. B.

Mr. H. Droop Richmond, late of the Khedival Laboratory, Cairo, has been appointed Chemist to the Aylesbury Dairy Company, *vice* Dr. Vieth, *resigned*.